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Mining companies and communities: Collaborative approaches to reduce social risk and advance sustainable development

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A B S T R A C T

In the past 15 years progress has been made advancing sustainability in the mining sector. Yet mining-community conflict continues to grow. While the causes of conflict are often complex and interwoven, water is a frequent trigger of mining-community tension. Mineral resources are often found in areas of water scarcity and in regions susceptible to climate change. Furthermore, mining requires substantial volumes of water for operations. Competition with communities and other industrial users for this increasingly scarce resource, gives rise to questions about whether mining can yield sustainable outcomes.

This paper investigates a hypothesis that it is possible to deliver more sustainable outcomes than those offered by traditional engagement and corporate social responsibility strategies if mining companies seek to resolve problems shared by both company and community, for example water supply.

A comparative analysis of two mining projects in the resource-rich region of Arequipa, Peru is employed to consider whether creating shared value may yield more sustainable outcomes than traditional corporate social responsibility approaches, may reduce conflict between mining companies and communities, and advance the agenda of the UN Sustainable Development Goals.

1. Introduction

From transportation to infrastructure, from energy to information technology, mining makes a significant contribution to society. Industry proponents like to suggest that if a product is not farmed, it must be mined. Yet the value mining offers frequently does not offset the impact the industry has on the lives of millions of people living in regions where mineral extraction occurs. In the past 15 years, increasing opposition to mining at the community level has been documented (for e.g. Hilson, 2002; Kemp, 2010; Davis and Franks, 2014). Scholars have recorded various drivers of conflict including procedural fairness (Zhang et al., 2015); the power imbalance that can exist between multinational mining companies and communities (Hamann, 2014); increasing demands for a fair share of the benefits generated by mining (Hodge, 2014); human rights impacts (Kemp et al., 2010), especially upon indigenous peoples living in areas where resources have not previously been developed (Hamann, 2014); and competition for scarce resources such as water (Bebbington and Bury, 2009). This paper investigates the potential to reduce conflict by building collaborative partnerships to address sustainable development issues of significant interest to both mining companies and communities that host extractive operations. The research is anchored in stakeholder engagement theory, which endorses the idea that creating value for stakeholders also creates value for shareholders (Freeman, 2010). The notion that business should add value to society is endorsed by many, yet divergent views remain on how to create that value. A central consideration of this paper is to assess whether mining companies can build partnerships that enhance business outcomes while simultaneously improving economic and social conditions in associated communities. This strategic approach to company-community relations is proposed to reduce conflict and advance more sustainable outcomes for both mining companies and host communities.

In seeking to further the discussion on this important topic, it is suggested that a number the UN 2030 Sustainable Development Goals (SDGs) address issues at the nexus of company and community interests. This includes access to water, which is the focus of SDG#6. To date, there is little scholarly research on the implementation of the SDGs, but one of the lessons learned from the delivery of the Millennium Development Goals, the precursor to the SDGs, is the importance of private sector participation. Sachs (2012) has stressed that the private sector must be "crucially engaged" and will need to provide leadership to secure the ambitious SDG targets. It will be argued that this creates an opportunity for mining companies seeking to build more effective stakeholder engagement strategies, reduce conflict, optimize performance, and align business interests with those of society.

The key question investigated in this research is: if mining

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companies and impacted communities work together to identify mutual needs, and then collaborate to address those common issues, will this shared approach to problem solving reduce conflict and advance sustainable development? A multi-methods research approach is used to investigate the hypothesis that it is possible to deliver more sustainable outcomes than those offered by traditional engagement and corporate social responsibility (CSR) strategies if mining companies employ policies and practices that resolve problems shared by both company and community.

For this paper, access to water for mining operations at two projects in the Arequipa region of Peru is examined. The intersection of water governance and water stewardship[1] is a topical issue, especially in resource-rich countries such as Peru, which are vulnerable to the impacts of climate change (Budds and Hinojosa, 2012). Water is also an issue relevant for both mining companies and communities that host extractive operations (Kemp et al., 2010), has implications for sustainability discussions (Prno and Slocombe, 2012), and is the focus of SDG#6 (Access to clean water and sanitation).

1.1. Mining-community conflict

In the mining sector, incidents of conflict between mining companies and the communities that host their operations are increasing (Hodge, 2014; Davis and Franks, 2014; Brereton et al., 2016). Zhang et al. (2015, p. 1063) note that "protests against mining operations and associated activities have constantly dominated headlines around the world, with the consequences ranging from interruptions to mining production through to the permanent closure of operations". Many of the mining company-community conflicts recorded in the past decade raise fundamental questions about social responsibility, local rights, governance, and the environment. Some have suggested that mining companies finding themselves at the centre of social responsibility and sustainability debates could play a leadership role in developing new and progressive ways of seeking solutions to common problems (Bebbington, 2014). Many of the common environmental and social problems Bebbington references are encapsulated in the United Nations (UN) 2030 Sustainable Development Goals (SDGs).

1.2. The opportunity of the UN Sustainable Development Goals (SDGs)

The SDGs (Fig. 1) were launched in September 2015 and represent an ambitious agenda for equitable, socially inclusive, and environmentally sustainable economic development. As the SDGs were introduced just three years ago, there is little academic literature on the effectiveness of implementation strategies or how the global goals impact business. Yet business leaders described the opportunities presented by the SDGs as ranging from improved economic performance, employee attraction and retention, and the creation of more than $12 trillion in growth opportunities (Business and Sustainable Development Commission, 2017). Mining, which has contributed to many of the problems the 17 SDGs seek to address, is also uniquely positioned to contribute to sustainable development agenda (World Economic Forum, 2014). This is attributable to the convening power of mining companies, their planning and technical expertise, and their global supply chains and networks, as well as their access to capital and technology.

The premise explored in this paper is that more sustainable outcomes may be achieved when mining companies and communities work collaboratively to address SDG issues, for example water supply and

SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

Fig. 1. The United Nations 2030 Sustainable Development Goals.
Source: http://www.un.org/sustainabledevelopment/news/communications-material/ Accessed September 9, 2017

infrastructure. The SDG agenda has been agreed to by the national governments of UN member countries, as well as development agencies, civil society groups, business and industry, and reflects shared agreement from diverse stakeholders on the most important sustainability issues. A rationale for business working towards the SDGs can be found in the fact that long-term profitability depends on healthy communities. Yet, George et al. (2016) warn that business alone cannot address the "grand challenges" embodied in the SDGs, noting that the targets require collective, collaborative, and co-ordinated effort. This should not be a deterrent to involvement on the part of mining, an industry accustomed to complexity, yet suggests strategy is required to advance the SDGs. With governments, development agencies, and NGOs agreeing that the SDGs represent social issues that require urgent – and collaborative – action, the SDGs seem to present an opportunity for mining to change its stakeholder dynamics.

It will be argued that the topics addressed by the 17 SDGs provide a context for discussing issues at the nexus of mining and community interests, and for facilitating multi-stakeholder collaboration for solving problems related to specific goals. If mining companies offer to add expertise and resources to address an issue previously identified by the community as important, perhaps mining companies could earn sufficient trust to be viewed as a valuable partner in sustainable development projects. Mining's stakeholders, including community leaders, government officials, and development agencies, can sometimes be reluctant to work with mining companies. This may be attributable to a perception that the well-being of communities has not increased in proportion to the profits of mining companies (Bebbington and Bury, 2009), or to a feeling that current models of resource extraction are failing to transform resource wealth into sustainable community development (Dobbs et al., 2013). This raises a question considered in this paper, might community stakeholders be more motivated to work with mining companies if tangible benefits to the community – such as the achievement of sustainable development priorities – are the projected outcome?

In addition to advancing the sustainable development agenda, it is suggested that these collaborative partnerships may improve stakeholder relationships, reducing conflict that adversely impacts both communities and extractive projects. Others have noted the importance of positive community relations (Kemp and Owen, 2013) and label it in a variety of ways. For some the approach is described as "strategic corporate social responsibility": actions that support core business activities to yield business related benefits to the firm (Burke and Logsdon, 1996). Another relevant concept is the creation of "enduring community value", described as value that remains within the community once the mine has closed (Fordham et al., 2017). This paper explores the premise that reframing stakeholder engagement to focus on SDG-issues may reduce mining-community conflict and support

[1] The World Wildlife Federation defines water stewardship as business understanding the risks they face from water scarcity and pollution, and collaborating with governments, other businesses, NGOs, communities, and others to protect shared freshwater resources to help ensure water is managed sustainably, as a shared, public resource. http://wwf.panda.org/what_we_do/how_we_work/our_global_goals/wter/water_management/.

more sustainable outcomes. Focussing on the common agenda of the SDGs also avoids a few criticisms associated with common stakeholder engagement approaches, anchored in philanthropic community investment. Some of these challenges include the following: philanthropic investment based on community wish lists results in chasing moving targets rather than long-term sustainable development objectives; the investment may only fulfill the expectations of a small minority; and philanthropy can create situations where the community cannot afford the annual operating costs of the facility built by corporate sponsorship (Rodríguez et al., 2014), making the gift unsustainable. In addition, it can be challenging for both companies and communities to measure the return on philanthropic investment. Money spent in a community is not a true metric of value. While it is easy to quantify outputs (number of organizations sponsored, number of people who attended company-funded events, etc.) it is difficult to measure outcomes, such as sustainable development, from philanthropy. And finally, attempting to build relationships based upon transactional engagement may increase the risk of conflict: both as stakeholders compete for funding, and because the more vocal and vociferous the community, the more attention and money it receives from company officials, who tend to respond more immediately to aggressive demands and threats versus polite requests (Zandvliet, 2004).

There appears to be opportunities for mining to contribute to the advancement of the SDG agenda, but in areas where mining has a poor reputation or where mining is an unwanted activity, what would motivate community stakeholders to engage with a potentially unwanted partner? In some cases, there may be nothing. However, in others, if communities can work with mining companies to identify points of intersection between the needs of the regions that host mining operations and the needs of the company, there may be opportunities for both parties to benefit: communities can access mining's financial resources, convening power and technical expertise to advance progress on important sustainable development priorities that are difficult to fund or execute on their own; mining companies can mitigate operational and social risk.

To investigate this premise that the SDGs could create a shared purpose that delivers benefits for both company and community this paper is structured as follows. The approach to select and compare two mining projects is described. Next, the case study context is described. Then the approach each company used to earn social approval at two of their mining projects in Peru is investigated. The results are examined, and conclusions are presented to address the research question: if mining companies and communities collaborate to address shared problems will a SDG-focussed approach support more sustainable outcome than those achieved by traditional stakeholder engagement strategies?

2. Methods

This paper is employs a comparative analysis of two mining projects with similar attributes but different outcomes. The resource-rich country of Peru was selected for examination. Peru was chosen because mining-community conflict in the country is documented by a nationally appointed ombudsman; has been extensively reported in the international media; and, this type of conflict has resulted in the delay, postponement, or cancellation of several large-scale mining projects. Peru, therefore, presents a country context conducive to investigating approaches to mining-community collaboration and sustainable development. Contrasting a project that experienced little opposition with another that resulted in a multi-year, sustained protest creates the opportunity to begin to build a theoretical understanding of the determinants of success when planning a mining project in an area where mining-community conflict is a common occurrence. The case context is described more fully in Section 2.2.

2.1. Media analysis

The research began with an analysis of media coverage to identify potential projects for review and comparison. The period examined was 2012–2016. This coincides with the development of the UN 2030 Sustainable Development Goals at the Rio + 20 Conference in 2012, and covers one year following the launch of the SDGs.

The principal tool for the media analysis was FACTIVA, the business news database owned by Dow Jones. FACTIVA aggregates content from more than 30,000 publications and newswires, including primary source agencies (i.e. those that break news versus simply reprinting the reports of news-breaking agencies).

As media reports are likely to highlight dramatic issues and cases, the first step in the analysis was a search for a mining project that attracted considerable or sustained coverage of mining-community conflict. To identify potential projects for investigation, FACTIVA was searched for news stories covering mining projects in Peru and containing key words from two verb categories to identify conflict situations: “mining and protest” and “mining and conflict”. The verb categories were adapted from a scale developed for the purposes of analyzing World Events Interaction Survey (WEIS) data.

For this research, reports of complaints or grievances, cancelled events, or a halt to negotiations were removed, as were “peaceful” protests. While these events document disagreements, stakeholder engagement theory suggests that if managed properly this tension can be productive and need not escalate to the types of conflict that inflict physical, emotional, financial, or reputational damage. As Bond (2014) notes, some degree of conflict is inherent in enduring relationships and, if managed properly, can support positive outcomes. These outcomes may include changes to design to minimize impacts, or as Bebbington (2014) suggests, conflict can drive improved performance and in so doing reduce future conflict (see also Bebbington and Bury, 2009). For this reason, only articles containing descriptions of sustained or multiple protests, expelling groups or personnel, destruction of property or equipment, threats with force, attacks, or violent assaults were examined to identify a potential project for desk top review.

Fifteen projects were the subject of news stories covering serious situations of mining-community conflict (Table 1). The largest number of news articles reported on conflict at the proposed Conga mine, inactive since 2011. In April 2016, project proponent, Newmont, made the business decision to abandon the mine development project. Since Conga was not active during the study period, the project with the second largest number of articles reporting on mining community conflict was reviewed.

Southern Copper's proposed $1.4 billion Tía María copper mine was the focus of 261 news stories within the study period and was branded by the Guardian newspaper as Peru's biggest mining conflict (Hill, 2015). Southern Copper was active during the study period, redesigning aspects of the project and continuing to pursue required permits. For these reasons, the Tía María project was chosen for closer examination. To select a case for comparison with Tía María, a search was undertaken to determine if there was another project in the same region of the country, Arequipa, active during the 2012–2016 timeframe, that

Table 1
Projects identified in the FACTIVA search for situations of serious mining-community conflict in Peru between 2012 and 2015 as reported in the international media. The bracketed number reflects the number of news stories generated in the reporting period for each project using search terms “mining and conflict” and “mining and protest”.

Ares (5)	Canariaco (36)	Conga (476)	Constancia (12)	Lagunas Norte (19)
La Zanja (14)	Las Bambas (130)	Michiquillay (16)	Quellaveco (52)	Rio Blanco (20)
Santa Anna (26)	Tía María (261)	Tintaya (110)	Toromocho (39)	Yanacocha (179)

Table 2
Comparative analysis of the Tía María and Cerro Verde projects.

Attribute	Tía María	Cerro Verde
Project description	Develop greenfield mine	Expand brownfield mine
Commodity	Copper	Copper
Estimated Reserves	6.41 billion tonnes of ore graded 0.39% copper.	4.63 billion tonnes of ore graded 0.38% copper
Location	SW Peru	SW Peru
Region/Departemento	Arequipa	Arequipa
Province	Islay	Arequipa
Principal water user	Agriculture	Agriculture
Majority ownership	Southern Copper • US • Publicly traded: New York & Lima exchange	Freeport-McMoRan • US • Publicly traded: New York exchange
Company owned operations in region (start year)	Toquepala Mine (1960) Ilo Processing Facility (1975) Cuajone Mine (1976)	Cerro Verde (1976) • Acquired by FCX 2007
Value of owners' regional production and percentage of contribution to national mining revenue	US$2.5 billion 11.3%	US$1.6 billion 7.3%
Project EIA filed	2011	2011
EIA approved	2014	2012
Construction permit	Pending	Granted 2012
Construction	Not started	2013
Commissioning	Target 2017 will not be met	May 2015
Social opposition	• Eight killed in protests 2007–2015 • 300 hospitalized in 2015 • State of emergency declared by federal government 2011 & 2015	• No production days lost to social opposition

had similar attributes but less conflict. The Factiva database search yielded an article from August 2014 that reported the large expansion project at the Cerro Verde mine was an exception to the social problems affecting other mining projects (Peru: An Overview, 2014). Cerro Verde is located approximately 200 km from Tía María in the Arequipa region of Peru. Environmental impact assessments (EIAs) were filed for both projects in 2011. Despite the similarities between Cerro Verde and Tía María illustrated in Table 2, the two projects had very different outcomes. While Tía María remains mired in controversy at the time of writing,[2] Cerro Verde's expansion project was commissioned on schedule with no production days lost to public opposition.

2.2. Desktop review

Once the two projects had been selected for review, constructed codes (Strauss and Corbin, 1998), also known as organizational categories (Maxwell, 2012, pp 111–112) were established. These codes were based on social responsibility, community relations, and sustainability literature; the author's practitioner experience; and, recent developments in the mining sector. Codes included: trust, stakeholder engagement, community relations, consultation, water, beneficiation (philanthropy, community investment), environment, and risk (legal, financial, operational, and social). The categories were used to sort data collected during the desktop review.

Documents reviewed included scholarly articles, publicly available archival material, and secondary sources including company sustainability reports, 10 K[3] filings, Extractive Industries Transparency Initiative (EITI) reports, and CDP submissions. Grey literature included reports and publications of the World Economic Forum, International Council of Mining and Metals (ICMM), International Finance Corporation (IFC), UN Global Compact, World Business Council for Sustainable Development (WBCSD), and other third-party publications.

[2] Late 2017.

[3] The U.S. Securities and Exchange Commission (SEC) requires companies traded on the stock exchange in the United States to file an annual 10-K report that provides a comprehensive summary of a company's financial performance.

2.3. Qualitative interviews

To investigate what actions Cerro Verde took that enabled the company to avoid the type of conflict experienced at Tía María, and to secure social permission for its expansion, in-person semi-structured, qualitative interviews were conducted with a small group (17) of Cerro Verde stakeholders. Interviewees were purposefully selected from the groups involved in project negotiation and execution – the company, the principal contractor, regulatory authorities, social groups, development agencies, and government personnel. The interviews were conducted under an University of British Columbia Behavioural Research Board certificate of approval H16-00245. A questionnaire was used to frame and guide discussion. Interviews were conducted in-person in Arequipa, Lima, or Vancouver, and lasted between 60 and 90 min. When no additional information emerged, it was assumed that saturation had been achieved. NVivo software was used to thematically analyze the interview transcripts using the constructed codes developed for the desktop review. When interviews were requested, prospective candidates were told the purpose of the research was to examine the decision of the mining company to treat municipal wastewater. Interviewees were advised that any questions asked could be left unanswered, and that the interview could be terminated at any point.

Although the number of interviews conducted was small, small samples can render accurate information if participants possess a high degree of competence for the domain of inquiry (Guest et al., 2006, p. 74). In addition, the findings of small sample qualitative studies may be of use in informing future discussions (Marshall and Rossman, 2014, p. 84). In this case, the small sample was deemed appropriate given the objective of identifying attributes of success for a single project, and because the qualitative findings are part of a multi-methods approach. Field research in Arequipa in May and October 2016 provided valuable observational data to complement the desktop review and interviews. Triangulation of observation, interviews, and the document review was used to provide a more accurate account than any of the methods could provide alone (Maxwell, 2012, p. 107).

Key questions explored in the Cerro Verde-specific analysis were:

- What approach did Cerro Verde use to secure social permission in a

country with highly mobilized opposition to mining?
- Can measurable business value be generated through clear identification of social problems that intersect with industry needs?
- If mining companies engage stakeholders on topic areas encapsulated in the UN 2030 SDGs, will addressing issues of mutual interest reduce mining-community conflict and support more effective stakeholder engagement outcomes?

2.4. Case context: Peru

In recent years, Peru has consistently been one of the top global producers of copper, silver, and zinc, amongst the largest gold producers, and is recognized for hosting some of the largest known copper reserves in the world. Mining in this resource-rich nation is a vital component of Peru's economy. In 2013, the industry contributed US$2 billion to the Peruvian government via tax and royalties (Brereton et al., 2016). In 2014, mining accounted for 14% of the country's gross domestic product (GDP), and mineral export revenues were US$16 billion, or 50.3% of the country's total exports, providing direct employment for close to 200,000 people (EY, 2015, p. 24).

Despite its financial contribution, there is little public trust in mining and Peru has been one of many countries around the world where mining-community conflict has increased in recent years (Brereton et al., 2016). The Peruvian Institute of Economics reports the country lost $14.9 billion between 2010 and 2014 in mining export revenue (2007 prices) from projects that did not happen due to social unrest (qtd. in Jamasmie, 2015). In 2014, it was predicted that opposition to mining projects in Peru would cost the country $57 billion in foreign investment, with news reports suggesting over $21 billion worth of mining projects were delayed in Peru due to social conflict (Jamasmie, 2015).

One issue of ongoing concern is that many of the mineral-rich areas of Peru are characterized by water scarcity. Water availability may be restricted due to arid conditions, or situations where surface water is abundant but only at certain times of the year in certain regions, and by the presence of existing water users including farmers, hydro-electric power, mining, other industrial users, and communities. Mining requires considerable water for operations (mineral separation and processing, transporting ore and waste, tailings management, dust suppression, washing equipment, human consumption, etc.). Competition for this scarce resource can trigger conflict between mining and communities.

In the next section, the data from desktop review of Tía María and Cerro Verde, and the qualitative interviews with Cerro Verde stakeholders, is analyzed to investigate the central research hypothesis: that more sustainable outcomes can be achieved if business and society collaborate on issues of mutual interest and that these partnerships can advance the agenda of the SDGs.

3. Results

3.1. Tía María: Argos Si, Minas No

Located in the Arequipa region of Peru, the license for Tía María's 32,990-hectare concession is owned by Southern Copper, part of Grupo México, and one of the largest integrated copper producers in the world. All Southern Copper's mining, smelting, and refining facilities are in Mexico or Peru. The company's website (www.southerncoppercorp.com) states Southern Copper employs 13,024 people, had sales in 2015 of $5.05 billion, net revenue of $0.74 billion and a market capitalization of $21.49 billion.[4] The company's Peru production equaled 11.3% of the country's mineral production in 2014 and was valued at US$2.5 billion (EITI, 2016, p. 49). Reading the company's annual and 10 K reports gives little hint of the conflict Tía María has generated in the Tambo River Valley of the Cocachacra district in southern Peru where the project has been suspended since 2011 following violent protests that left four dead.

Like many other mining-community conflicts, one of the issues driving opposition to the proposed copper mine is competition for water and concerns about potential water contamination. The Tía María mine is to be located two kilometres above the Tambo Valley, a fertile agricultural region. The company's intention to use ground water to supply the mine was met with fierce opposition from farmers concerned the mine would contaminate the local river, adversely impact underground water sources, and destroy local crops. The Cocachacra district, where the mine would be built, is home to commercial farmers and is considered relatively prosperous. The company's promise of 3500 construction jobs plus 600 direct and 2000 indirect jobs during the 20-year life of mine seemed to have little appeal. In addition, Southern Copper has been operating in the region since the 1960s and its reputation does not appear to have engendered trust that Tía María would not have environmental impacts. In May 2016, Reuters news agency quoted then-presidential candidate Keiko Fujimori saying, "Farmers in the Tambo Valley of Cocachacra obviously feel deep distrust, and it will take many years for the company to regain that trust," (Reuters, 2016). To instill confidence in the mine review process, the Peruvian government agreed to have the United Nations Office of Project Services (UNOPS) review the project's EIA. Among the UNOPS findings was that the EIA did not contain a hydro-geological study and that the proposal called for using water from an estuary (Holland, 2015). This contradicted the company's claim that it would use sea water to address community concerns about the mine withdrawing groundwater for operations. Following violent protests in 2011 when Tía María's EIA was approved by the government, the company went back to the drawing board, revising the EIA and resubmitting it in 2014. Southern Copper now pledged to build a desalination plant to source water for mining operations. But locals again took issue, with SML Metals and Mining Daily reporting 15 January 2014 on a situation of extreme tension in the Tambo Valley, where one public hearing for the EIA was attended by 3000 residents and 4000 armed police.

To earn support for the project, Southern Copper,

> "established a multi-faceted encounter plan, which began with a national media campaign, followed by a door-to-door campaign in the neighboring district of Cocachacra. The purpose of the campaign was to explain the relevant environmental aspects of the project and answer questions. Tía María will use desalinated seawater and SX/EW technology with the highest international environmental standards, which are considered the most environmentally friendly in the industry, as no emissions are released into the atmosphere. (Southern Copper Corporation (a), 2015, pp. 2–3)

In addition, in 2014, the company offered to establish a $29 million fund to invest in social and infrastructure improvements in the communities surrounding Tía María. This traditional approach to community relations – a public relations/information campaign plus philanthropic investment – appears to have done little to assuage local concerns or to earn social acceptance for the mine. In 2015, protests were once again planned. The first two days appear to have been relatively peaceful but then the international media began reporting the presence of hundreds of police in riot gear. As the week wore on, three demonstrators and one police officer were killed, with 200 protesters and 100 police were injured. On May 23, the president of Peru declared martial law and imposed a two-month state of emergency.

When Southern Copper filed its 10 K report for 2015, the Tía María situation was described as follows:

> Our mining or metal production projects may be subject to additional costs due to community actions and other factors. In recent years, worldwide mining activity has been pressured by neighboring

[4] As of November 1, 2016.

communities for financial commitments to fund social benefit programs and infrastructure improvements. Our projects in Peru are not exempt from these pressures. Our Tía María project in Peru has experienced delays while trying to resolve difference (sic) with community groups. It appears that it is becoming a part of the Peruvian mining environment that in order to obtain acceptance from local communities for projects in their localities, demands for substantial investments in community infrastructure and upgrades must be met in order to proceed with the mining projects. We are confident that we will move forward with the Tía María project. However, we cannot assure you when and that we will not continue to incur additional costs for community infrastructure and upgrades in order to obtain the approval of current or future mining projects." (Southern Copper, 2015 b, p. 15)

In a presentation to an investors conference in September 2016, the company rated Tía María as a probable project and it remains listed on the Southern Copper website.

Locals seem to have a different view. In the fall of 2016, nearly all the houses in the Tambo River Valley were adorned with bright green flags bearing the slogan "Agros si, mina no!" (Farming yes. No to the mine). Jesus Cornejo, president of the water-users' committee in Cocachacra, has said "The conditions will never exist for the company to operate" (Economist Intelligence Unit - Executive Briefing, 2016). These views are consistent with academic theory whereby a corporation's past shapes its public reputation and where companies with a known, or even perceived, history of wrong doing often find that new projects are problematized (Schrempf-Stirling et al., 2016).

Southern Copper has not publicly disclosed the dollar value of the loss of delayed production in net present value terms, but the project was originally meant to start operations in 2012. As of 2017, the required construction permits and licenses had not been issued by the Peruvian government. This means it will not be possible for the project to come into production in early 2018 as predicted by the company.

Southern Copper's effort to earn approval for the project appears to reflect traditional approaches to community engagement: an advertising campaign, a door-to-door public relations exercise, a philanthropic investment fund. Ongoing opposition to Tía María suggests the tactics employed by the company were not effective at demonstrating the project would deliver sustainable outcomes. Local concerns about water supply are legitimate: as noted earlier, Peru is considered one of the countries must vulnerable to the adverse impacts of climate change. When considering water quality and quantity, are there points of intersection to be found between mining's needs and those of its host communities? If so, could mining companies take a more strategic approach to water: one that delivers value for both the company and community? To answer that question, the Cerro Verde expansion project is examined next.

As noted in Table 1 the Tía María and Cerro Verde are located approximately 200 km apart in the same region of Peru. The two projects share many common characteristics: both are large-scale copper mines, both operate in areas of water scarcity where agriculture is the predominant industry, and both companies have a long history of operations in the region.

3.2. Cerro Verde and the circle of water

The Cerro Verde copper mine is in a desert environment approximately 30 km southwest of Arequipa City in the Arequipa region (departemento). The fertile agricultural region of La Joya is approximately 56 km southwest of the mine, also within the Arequipa region. With estimated reserves of 4.63 billion tonnes of copper, Cerro Verde is one of the largest copper reserves in Peru. Freeport-McMoRan (FCX) acquired a 53.6% interest in the massive copper mine in 2007.

As one of Peru's top copper producers, Cerro Verde makes a significant financial contribution to the country and the region. In 2014, before the expansion, Cerro Verde's operations and investments generated a total impact of $4.13 billion, equal to two per cent of Peru's gross domestic product (GDP) with approximately 40% of the municipality of Arequipa's tax income coming from canon minero[5] money (Filippi et al., 2014, p. 542). The US$4.6 billion expansion project, completed in 2015, enabled the mine to triple throughput from 120,000 t per day (tpd) to 360,000 tpd. Post expansion, in 2016, Cerro Verde's production totalled 1.1 billion pounds of copper (Cu) and 21 million pounds of molybdenum (Mo) (Freeport-McMoRan, 2016).

When personnel at Cerro Verde began planning for a mine expansion a key consideration was how to access the volume of water that would be required for processing the additional ore. As the mine operates in an area of water scarcity, and where access to clean water is one of the region's most important needs, securing access to water for mining operations was recognized as both a fundamental operations requirement and potential project risk. As noted earlier, concerns about the allocation of scare water resources had triggered massive conflict for other mining projects in Peru including Conga and Las Bambas, as well as Tía María. To reduce the risk of the type of conflict that had disrupted or stalled other mining projects in the country, Cerro Verde personnel recognized it would be critical to engage stakeholders and avoid placing the mine in competition with farmers for clean water. Agriculture accounts for 80% of the water use in Arequipa (Filippi et al., 2014). When Cerro Verde commissioned an evaluation of the river basin, the results indicated already limited volumes of fresh water had the potential to be adversely affected by drought.[6] It was therefore recognized that any proposal to use that source of water for mining was likely to create the type of conflict that had disrupted other projects, including Tía María.

Conscious of the need to look for a sustainable solution – one that would benefit all water users and not exacerbate supply issues – mining personnel, in consultation with regional officials, government representatives, civil society groups, and water authority organizations, made the decision to explore the possibility of the mine using treated municipal wastewater. The idea of the mine using treated wastewater for mining operations was first proposed by social leaders and local water authorities, and then endorsed by the professional engineers' association of Arequipa.

Although no other mining company in Peru was using water from municipal effluent in its operations, Cerro Verde believed this could be an option for a reliable supply of water not affected by seasonal drought. In addition, as water allocations for farmers did not include contaminated water from the Chili River, using treated wastewater for mining operations would not place the mine in competition with farmers for fresh water.

An agreement was negotiated that required mayors from municipalities within the Arequipa region to work together to secure a site for the plant and to finance its construction using canon minero funds. Cerro Verde would pay for the technical engineering studies necessary for the wastewater treatment plant. Servicio de Agua Potable y Alcantarillado de Arequipa (SEDAPAR), the regional utility, would operate and maintain the new plant with the objective of treating all wastewater from the city of Arequipa. At the time of the consultation,

[5] **Canon minero:** Law No. 27506 signed in 2001 established that 50% of the corporate income tax paid by mining companies would be allocated to a fund called the canon minero. The law also set out the rules for sub-national revenue transfer stipulating that the national government would transfer 25% of the canon minero to the regional government that hosts the mining operations. Derivation is the primary criteria used. Initially, canon minero funds could only be used to finance public investment that would benefit the community and support sustainable development projects in the region where mineral extraction occurs. The terms of canon minero were modified in 2003, under Law No 28077, to allow the use of canon minero funds for infrastructure (Aresti, 2016).

[6] In January 2016, the Peruvian government declared a temporary state of emergency with respect to the water supply in the Rio Chili Basin because of drought conditions. As a result, the Cerro Verde water rights from the Rio Chili were temporarily decreased during February 2016 (FCX Form 10 K, p. 48).

just eight per cent of Arequipa's municipal wastewater was being partially treated (Filippi et al., 2014), with the remainder discharged directly to the Chili River, which serves as the principal water source for the region. In five spots along the river, the level of fecal coliform exceeded World Health Organization standards set to provide safe levels for agricultural irrigation and water consumption by livestock.

By 2008, two years after the initial agreement, Arequipa mayors had made little progress securing the required canon minero funding and had not been able to find land suitable for the plant. As a result, it was suggested that Cerro Verde pay for construction, operation, and maintenance of the plant in exchange for a portion of the treated water for use in the expanded operations. This proposal seemed to present a viable solution to the municipal sewage problem and to the mine's water requirement, and consultation plans were developed to enable public review of the proposal.

Beginning in 2010, more than 200 meetings and workshops were held to explain the wastewater treatment project to municipalities and authorities, to citizens of Arequipa, and to water users upstream and downstream of the mine. The stakeholder groups were broad and diverse. In addition to face-to-face meetings, a multi-directional communications program, social media, television, newspapers, radio programs and advertising, helped to build awareness of the wastewater treatment proposal and solicit feedback. Key issues raised during the consultation included questions related to water allocations; the mine's role in the provision of water infrastructure; as well as issues related to water quality, health, jobs, and education.

By 2011, it was agreed that Cerro Verde would partner with regional and municipal governments and water management authorities to plan, build, finance, and operate a wastewater treatment plant. It was also agreed that the plant could be built on land inside the mine concession thereby resolving the siting issue. In exchange, the mine would receive a guaranteed volume of treated wastewater for use in the expanded concentrator operations. During the period when the mine was operating and maintaining the plant, use of the treated water would be provided free of charge. The treated water not allocated to the mine would be returned to Chili River helping to rehabilitate the river and improve its water quality, reducing water borne illness, and improving agricultural output.

Preliminary permits for the mine expansion were granted in 2011 and a construction permit was issued in 2012. The US$450 million wastewater treatment plant was commissioned in November 2015 and now treats 85% of Arequipa's municipal sewage.[7] Current plant capacity is 1.8 m^3/s. Representatives of the local water utility, SEDAPAR, owned by regional municipalities, work closely with Cerro Verde personnel to collect the wastewater and monitor water quality. Administracion Techi a del Distrito Riego (ATDR) regulates daily discharge of the treated water to the river. Cerro Verde is responsible for day-to-day plant operations and the reporting mandated by regulatory authorities. To meet the projected population growth of Arequipa, the capacity of the wastewater treatment plant is projected to increase in two future expansions: to 2.1 m^3/s in 2029 with a final expansion in 2036 to increase treatment capacity to 2.4 m^3/s until 2043, the projected end of mine life.

In interviews, water authority representatives reported that the Peruvian government is promoting the re-use of treated water, especially in arid places like Arequipa, and believe Cerro Verde is the first in Peru to treat and use municipal waste water in mining operations. Today, while there are some concerns about the mine receiving 1 m^3/s of the treated wastewater, thereby decreasing the volume of river water by that amount, farmers' water quotas – set by authorities – have not changed. Interviews conducted in Arequipa in May and October 2016 suggest that the trade-off in a lower river water volume to secure improved river water quality, and Cerro Verde's role in the provision of water infrastructure for Arequipa, is accepted. This view is reinforced by Filippi et al.:

> "It is important to note that among Arequipeños, there is overall appreciation of Cerro Verde's investment in water infrastructure. More water is available, more inhabitants are connected to drinking water and sewerage infrastructure, and potentially more wastewater will be treated than would have been without Cerro Verde's intervention." (Filippi et al., 2014, p. 544)

4. Discussion

The desktop review of Tía María suggests the company used traditional engagement and social responsibility tactics to attempt to secure social permission for the proposed mine: an information campaign to inform stakeholders of the mine plan complemented by philanthropic investment. In contrast, Cerro Verde acted on a proposal brought forward by community stakeholders, which gave the mine a role to play in addressing a critical social and sustainability issue. Qualitative interviews with Cerro Verde's stakeholders suggest the company was focussed on building a collaborative approach to address a shared company-community problem access to clean water, an issue that is the focus of SDG#6.

As an alternative to fresh water, municipal sewage offered Cerro Verde a source of water not in use by others, one with the potential to be a more reliable supply than fresh water, and one that has the potential to increase given Arequipa's growing population. In addition, the re-use of effluent is being promoted by the Peruvian government as a sustainable water supply for the mining sector. This meant the project could help to meet an important policy objective of a key stakeholder.

Although Cerro Verde was completed as the SDGs were introduced, the case offers an example of how mining companies and communities can work together to advance the sustainable development agenda, and deliver value for both mining companies and host communities. In this case, water was viewed as a shared company-community risk with water management considered from the beginning of project planning. As noted above, the wastewater treatment project aligns with SDG #6 Access to Clean Water and Sanitation, one of the goals to which mining has potential to make a significant contribution.

For other companies considering ways to set business strategy aligned with the UN SDGs, the collaborative approach Cerro Verde took to address both a business need and social issue is encouraging. It is unlikely that there will ever be one shared view of water use or water governance, but agreement is growing that private public partnerships and collaboration are required to address what academics call "the grand challenges" associated with sustainable development (George et al., 2016).

4.1. The business case

Planning a project with a sustainable development focus sounds admirable, but does it deliver a return on investment sufficient to satisfy shareholders with a short-term focus? This is difficult to answer based on research into one operation. However, the Cerro Verde research suggests success can be measured in terms of value protection, value capture, and potential value generation.

- Value protection: Unlike other projects in the region, the Cerro Verde mine did not experience any lost production due to community opposition. This delivers business value that can be quantified by examining the costs associated with delayed production in net present value terms. Cerro Verde produced 500 million pounds of copper and 11 million pounds of molybdenum in 2014 (Freeport-McMoRan, 2016, p. 15). At a net average realized price of $3.09/lb.

[7] A further 14% captured by a smaller plant, La Escalerilla, commissioned in 2015. This plant, located in the North Cone area of Arequipa City, does not supply water for mining operations.

of copper (Freeport-McMoRan, 2015), daily copper production in 2014 would have been equivalent to approximately $4.2 million/day. This rough calculation does not include molybdenum production from Cerro Verde (11 million pounds in 2014) but illustrates the value retained from not losing any production days to social unrest. In addition, by agreeing to operate the wastewater treatment plant, the mine can monitor water output thereby reducing the risk to concentrator operations associated with variability in water quality.

- Value capture: A water supply for expanded operations was secured. By using treated waste water, which is not a water source included in agricultural allotments, Cerro Verde avoided competition with farmers for scarce water resources. The company also secured a water supply that is drought resistant and that has the potential to increase in future years as the city's population grows.
- Value generation: Once the expanded concentrator was operational, production increased to 1.1 billion pounds of copper per year, or approximately 3.03 million pounds/day. At the reported net average realized price of $2.21/lb. (Freeport-McMoRan, 2016) daily copper production in 2016 would be worth approximately $6.7 million/day or $47 million/week. This represents value generation of $2.5 million/day or approximately $17 million/week. Again, this calculation does not include molybdenum production (21 million pounds in 2016).

4.2. Social determinants of success

Equally important when assessing sustainable development is the fact that the wastewater treatment plant delivers tangible benefits to the community.

- Approximately 99% city sewage is now treated, making the wastewater treatment plant an example that delivers benefits not just to a few elites but distributes benefits to all.
- Fecal coliform levels in the Chili River have been reduced (Table 3), which reduces incidents of water-borne illness. Interviews with water authorities indicate water quality in the Chili River and in the river basin has improved significantly as measured by higher biological oxygen demand (BOD) per litre.
- Co-management of the wastewater treatment plant is building local technical capacity.
- The improved water quality in Chili River basin has the potential to enhance agricultural production, as well as support recreational activities and tourism opportunities for the region. In March 2017, officials report that trout were photographed in the Chili River near the Arequipa community of Uchamayo.
- Before the wastewater treatment project, water authorities did not have scientifically measured water quantities. As part of the wastewater treatment plant operations, sewage intake and treated water discharge to the Chili River is measured. This systematic approach helps to answer stakeholder questions about water allocation and availability.

4.3. Creating shared value

One of the challenges that has been noted with the SDGs is that the goals are ambitious and there is no clear strategy prescribed for advancing the SDG agenda. In analyzing the Cerro Verde case, it seems that an economic theory branded as “creating shared value” (Porter and Kramer, 2011) might offer a strategy that mining companies could use to operationalize the SDGs. Creating shared value (CSV) is defined as policies and activities that measurably improve socio-economic outcomes and improve related core business performance (e.g., decreased operational costs, enhanced productivity, and/or a predictable and stable business environment).

As a business strategy, CSV establishes a framework for identifying opportunities to address societal issues and deliver business value (Shared Value Initiative, 2014, p. 6). CSV also offers a mean to address complex social problems that are at the root of market failures – situations in which socio-economic conditions prevent conventional business models from succeeding (Kramer and Pfister, 2016). To be effective, mining companies will need to identify social issues that intersection with business needs. Relevant issues are likely to occur in most regions where mining takes place and, as noted previously, many of these issues are encapsulated in the SDGs. There appear to be several benefits to approaching stakeholder engagement and the SDG agenda using the CSV strategy. As CSV is an economic approach, tied to the bottom line, there are systems in place to measure and monetize success. This addresses a fundamental challenge with traditional CSR approaches where efforts to monetize issues that do not have financial equivalencies have been challenging and where questions remain about the ability to prove a business case for CSR. The CSV approach can be embedded enterprise-wide, rather than being owned by a single department, while being directed by individual business units. Within mining companies, where different sites can operate with a high degree of autonomy, this approach empowers local teams to work with local communities to identify areas for collaboration. And, because communities will see direct benefit on issues they identify as important, using the CSV strategy to address SDG issues may serve to mitigate social risk.

The Cerro Verde case study sought to identify the determinants of success. Based on the research, these can be summarized as follows:

- Identification of an issue that is important for both business and society. In the Cerro Verde case, the issue was water supply.
- Create a forum where innovative ideas can be brought forward and considered.
- Build a business case with sustainable development as a central consideration.
- Ensure that project benefits accrue to society, not just a few elites.
- Partner with other organizations to ensure all parties’ needs and interests are represented,
- Commit to communications and to consult with a full range of stakeholders to review the project proposal and secure social permission.

5. Limitations

The research findings are limited in several ways, some of which create opportunities for future studies. The comparative analysis of the Tía María and Cerro Verde projects would be strengthened by conducting one-to-one interviews with Tía María proponents and stakeholders. While the two projects have many points of similarity, the fact that no qualitative work was done when examining Tía María limits the

Table 3
Chili River fecal coliform and BOD counts pre-and post-wastewater treatment. Measurement figures provided by Cerro Verde and SEDAPAR.

Measure	Unit	Maximum standard	Average before sewage discharge to river 2013	Average after discharge 2013	Effluent discharge 28/02 2017
Fecal coliform/100 ml	MPN/g TS	10,000	1441	4,780,915	23
Bio-dissolved Oxygen Demand (BOD)	Mg/l	100	2.5	123.64	15

ability to do a robust comparison of the two projects. It must also be noted that different approaches to stakeholder engagement on water are likely not the only differences between Tía María and Cerro Verde. Factors not considered and worthy of future research include management philosophy and decision-making, autonomy of local teams, and shareholder commitment to the long-term vision required for sustainable development projects.

In addition, although saturation seemed to be achieved in the Cerro Verde interviews, the small sample size limits the findings. Elected municipal leaders were not included in the Cerro Verde interviews. One-to-one interviews with mayors of 32 municipalities within Arequipa would enrich the findings and would likely illustrate the complexity of perspectives presented during the consultation and negotiation process for the wastewater treatment plant, and its subsequent operations.

While the SDGs offer the potential for a common agenda to address the “grand challenges” that affect both mining companies and communities there is no guarantee that either companies or communities will wish to work collaboratively on SDG initiatives. In situations where trust between company and community is low, as appears to be the case for Tía María, community stakeholders may refuse to work to advance a project that they fundamentally oppose. It must also be noted that awareness of the SDGs may be low in many resource-rich communities. This suggests that there is a need to focus on the issues encapsulated by the SDGs (e.g. access to water and sanitation, shared infrastructure, education, economic beneficiation, etc.) rather than the goals themselves.

Lack of trust creates a further limitation in practice. Executing SDG projects requires partners. For some mining companies, in some operational contexts, this may be challenging due to mining's poor reputation and low levels of public trust. This may mean that community representatives and government officials resist company engagement on sustainable development projects and may not be willing to see the mining company as a collaborative partner. Companies may also resist embracing SDG subject areas, concerned that engaging on these social problems could create the perception that the company will pay to fix systemic social issues.

While the SDG agenda is broad, there is no guarantee that all mining projects will be in areas where SDG projects can be identified. Furthermore, when projects and partners are found, achieving positive outcomes will still not be easy. There may be competing and changing agendas amongst the partners that impact SDG project planning and/or execution. Furthermore, critics have suggested that when successful, creating shared value will create “win-win” projects in a sea of unresolved environmental and social problems (Crane et al., 2014).

6. Conclusions

The point of intersection between a company's needs and a community's needs on issues such as water creates the potential for conflict. As the Tía María project demonstrates, traditional approaches to secure community consent to access the water needed for mining operations can fuel community concerns that business interests will trump social needs. Yet, the common interest in water also creates an opportunity for mining companies to make a significant contribution to sustainable development by building collaborative partnerships and exploring joint solutions. The Cerro Verde case suggests that when water scarcity is viewed as a shared risk, managed with a catchment-based approach that considers other users, sustainable outcomes may be found, and conflict reduced. Another distinguishing feature of the Cerro Verde case is that community stakeholders were the ones who proposed that the mine treat municipal waste water in exchange for a water supply for the mine's expanded operations. Stakeholders viewed wastewater treatment as a way in which the mine could make a meaningful contribution to regional sustainability beyond the benefits accrued from royalties, jobs, and tax payments. This appears to support the premise that working with stakeholders to identify sustainability issues and then building collaborative partnerships to address those issues – many of which are encapsulated within the 17 SDGS – might yield more positive stakeholder engagement outcomes and advance the SDG agenda.

It is noted that identifying sustainable development projects can be challenging. Communities are not homogeneous. They are made up of many distinct groups, with different – sometimes conflicting – needs and expectations. The diversity of stakeholder interests means finding projects that match community aspirations with business needs requires a willingness to engage, remain open to new ideas, and commit to collaborate on solutions to what can become intractable problems, such as access to clean water.

Mining companies’ action on catchment-based approaches to water and sanitation is relatively nascent, but the Cerro Verde case suggests such efforts can increase long-term business resilience and enhance a company's reputation. Research indicates there is financial value to a good reputation (Fombrun and Shanley, 1990; Roberts and Dowling, 2002; Barnett, 2007; Eccles et al., 2007; Herz et al., 2007). In this paper, it is argued that Cerro Verde built reputation capital by supporting regional progress on SDG#6 (access to clean water and sanitation). Of equal importance, Cerro Verde created shared value. By working collaboratively with water stakeholders, an opportunity that met both a business need and a social need was identified. Finding this point of intersection enabled Cerro Verde to secure water for mining without the conflict Tía María experienced. For Arequipa, the outcome of the Cerro Verde expansion delivers social value: sewage treatment in the city, rehabilitation for the Chili River, reduced incidents of waterborne illness, and improved agricultural production. This is relevant because,

> The corporations that win in today's competitive, resource-scarce and hyper-transparent world are those that create real value for society. They are those who see their success as inextricably linked to the success of the world around them. The interconnectedness of water and sanitation on all aspects of economic development is undeniable. According to the United Nations, “For each dollar invested in water and sanitation, on average there is a return of eight dollars in costs averted and productivity gained. (Schulte and Fenwick, 2014, p. 21)

The case confirms that interactions between mining companies and communities regarding water can be complex and multi-faceted. The case also suggests that it is possible to build collaborative partnerships to address issues of importance to both business and society. The question of the business case for sustainable and socially responsible development has long troubled both practitioners and academics. It is hoped this case will help companies wishing to establish sustainability as a core business strategy and is so doing advance the agenda of the UN 2030 Sustainable Development Goals.

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